THE JOHNS HOPKINS UNIVERSITY

DEPARTMENT OF PHYSICS

CALIBRATION FACILITY

SAFETY PLAN

NASA/MSC Contract NAS 9-11528

Task I

Submitted by
Wm. G. Fastie
Principal Investigator

18 October 1971

Baltimore, Maryland 21218

CALIBRATION FACILITY SAFETY PLAN

for

Apollo 17 UVS S169

Contract No. NAS 9-11528 - Task I.

Department of Physics
The Johns Hopkins University
Baltimore, Maryland 21218

18 October 1971

ii

TABLE OF CONTENTS

TABLE OF CONTENTS - (Cont'd.)

CALIBRATION FACILITY SAFETY PLAN

for

Apollo 17 UVS S169

1.0 Scope

1.1 Purpose

The purpose of this document is to present a set of requirements to insure that the highest practicable standards of safety for the Calibration Facility are established and carried out.

1.2 Objective

The objective of this document is to identify all critical or catastrophic type hazard areas, to eliminate or reduce these where practicable, and to counteract or reduce the effects where total elimination is not feasible.

1.3 Applicability

This plan covers all functional operations in calibrating the ultraviolet spectrometer (UVS) and testing the UVS components. The plan applies to the entire Calibration Facility including the White Room, vestibule, Anteroom and Pump Room. See Figure 1.

2.0 Documents

The following documents are applicable to the extent specified herein:

MSCM 1701, "System Safety Plan (Manned Space Flight Program)"

MSCI 8825.2, "MSC Test Safety Review Committee"

MSCI 8825.1A, "Operational Readiness Inspections of MSC Test Facilities and Equipment"

MSCM 1700, "MSC Safety Manual, Part 7 - Man Rating Requirements"

National Safety Council, Chicago, Illinois, "Accident Prevention Manual for Industrial Operations, 5th ed., 1964.

Maryland Dept. of Labor and Industry, "Occupational Safety" 1955.

3.0 Definitions

3.1 Safety Terms

a. Safety - Freedom from chance of injury or loss to personnel, equipment or property.

b. System Safety - The organized application of scientific and engineering techniques and analyses for the identification of potential hazards throughout all phases of the program life cycle.

c. Public Safety - The extension of system and industrial safety for the protection of the general public.

d. Hazard - Condition(s) which can cause personnel injury or death, significant loss of equipment or

property, and/or produce harmful change in the natural earth environment.

e. Inherent Hazard - The presence of a risk resulting from equipment design, equipment intrinsic nature, environment, procedural deficiency, or combinations of these conditions.

3.2 Hazard Categories

Hazard categories are established to assure that potential hazards receive proper attention in the design phase. These systems and/or procedures will be placed in the appropriate hazard category:

a. Safety Catastrophic - Condition(s) such that environment, personnel error, design characteristics, procedural deficiencies, or sub-system or component malfunction will cause death or injuries to personnel.

b. Safety Critical - Condition(s) such that environment. personnel error, design characteristics, procedural deficiencies, or sub-system or component malfunction will cause a hazard which requires immediate corrective action to avoid loss of or injury to personnel.

c. Safety Marginal - Condition(s) such that environment personnel error, design characteristics, procedural deficiencies, or sub-system failure or component malfunction will degrade system performance but

which can be counteracted or controlled without major damage or any injury to personnel.

d. Safety Negligible - Condition(s) such that personnel error, design characteristics, procedural deficiencies, sub-system failure, or component malfunction will not result in major systems degradations, and will not produce system functional damage or personnel injury.

4.0 Management

4.1 Policy

The Calibration Facility Safety Program provides for an organized activity in which management efforts and technical disciplines are coordinated to provide timely identification and the required corrective action to eliminate or control those conditions or events that will contribute to injury or loss of operating personnel, system failure, or damage to equipment and hardware throughout all phases of the program.

4.2 Management and Control

Management and control policy provides for and insures implementation of the following:

a. Specialized safety engineering and technical competency for system safety and personnel safety tasks.

b. Functional participation by "in-line" disciplines in the safety program effort.

c. Management awareness of risks and requirements for risk management.

d. Establishment and compliance with safety requirements and criteria that are commensurate with the scope of the Apollo UVS Calibration Program.

e. Each individual employed in the Calibration Facility will receive a copy of this plan. See Para. 5.9.

4.3 Organization

The Calibration Facility organization has been structured as shown in Figure 2. The Safety Engineer is the single focal point for the total safety program management and responsibility. He will establish direct contact with the Principal Investigator when required, concerning safety requirements and safety problems.

5.0 System Safety Tasks

5.1 Reports

Written reports will be prepared on an "as required" basis for the following:

a. Safety reviews conducted and covering those procedures or items identified as "Safety Critical" or "Safety Catastrophic."

b. Design changes affecting safety and their status.

c. Safety discrepancies, their disposition, and status.

d. Summaries of accident/incident and failure reports as necessary.

5.2 Safety File

A safety file will be established as a central control point for all documentation relating to the safety program. This file will include but not be limited to:

Correspondence

Safety Plans

Directives

Engineering System Safety Analyses

Operations System Safety Analyses

Safety Manuals

Hazardous Materials Controls

Reports to MSC

Audit Reports

Accident/Incident File

Safety Corrective Action File

Safety Alerts

Certificate of Acknowledgement

5.3 Reviews

The Safety Engineer will participate in reviews for assessment

and resolution of safety problems and insure response to identified hazards.

5.4 Audits

Existing design drawings will be reviewed for safety consideration of mechanical design, i.e., sharp edges and protuberances, burrs, improper arrangement, pinch points and shear points. Electrical design will be reviewed for possible electric shock hazards, proper instrumentation safety grounding, wire encasement, and current limiting devices where required. Incoming parts inspection of vendor items will be monitored as required for safety compliance. In-house fabrication processes will be monitored to insure safety compliance with current "Alerts" and other governing documents. To insure a continuous safety overview of experiment phases and to provide proper safety input during all phases, all top assembly drawings, test and operational procedures and formal specifications and/or drawing changes will be reviewed by the Safety Engineer; and the Safety Engineer will be represented at all program design reviews and "in-house" meetings.

5.5 Accident/Incident Investigation

The Safety Engineer is responsible for accident/incident investigation of all cases under the Calibration Facility jurisdiction.

5.6 NASA Alerts

NASA Alerts and Technical Information Bulletins will be reviewed for safety implications and application to this experiment, and filed for future reference.

5.7 Human Error

A study will be conducted of all manually initiated experiment commands to determine potential for error and the effects of such errors.

5.8 Identified Hazards

All identified hazards will be reported to the Safety Engineer.

5.9 Distribution

Each individual employed in the program will be issued a copy of this plan. He will sign a certificate that he has read and understands the contents.

6.0 Safety Precautions

6.1 General

Other than the usual hazards associated with combustible materials, high voltage, and personnel carelessness, only a few areas in the Calibration Facility present any significant safety problem: liquid nitrogen, compressed nitrogen, and Freon TF inhalants.

6.2 Common Precautions

The common laboratory precautions are condensed herein

as a reminder to all personnel connected with the Calibration Facility:

a. Do not smoke in prohibited areas.

b. Always use grounding plugs with portable electric powered devices.

c. Keep the machinery and work areas clean and orderly.

d. Dispose of accumulated trash daily.

e. Turn off power to equipment before attempting repair.

f. Ascertain the location of fire fighting equipment such as extinguishers and hoses; fire alarms; ventilation alarms; and showers.

6.3 Liquid Nitrogen

Liquid nitrogen dewars will be maintained in the White Room as well as the Pump Room. The main hazard is the low temperature, 77.3°K. Therefore, gloves and face shields should be used any time this substance is handled in open containers. Keep the vents free of ice and pressure relief mechanisms unplugged. Two persons must conduct filling operations in the Pump Room.

6.4 Compressed Nitrogen

Compressed nitrogen cylinders possess a hazard because of their high pressure - 2,000 psi. These cylinders must be handled carefully and transported only when the

safety caps are in place. Whether in storage or use, these cylinders must be fastened to a strong support or chained to the wall. Identify the gas from the color code before piping into the system. Use only the cylinder valve to turn the gas on and off - not the regulator.

6.5 Vapor Degreaser

6.5.1 The degreaser installed in the Pump Room utilizes FREON TF liquid as a solvent. In proper operation the vapor in the room will not exceed 1,000 PPM which is the hazard threshold. Consequently a fume hood is not required, particularly since the room is designed with a fresh air intake and a fume exhaust with an air handling capability of 2,000 CFM.

6.5.2 The following general precautions should be observed:

a. Insure that the fume exhaust is functioning.

b. Keep the degreaser lid in place except when loading or unloading.

c. Insure that cold water is flowing through the unit by observing the effluent in the drain air gap.

d. Insert and remove materials slowly in the unit.

e. Perform any liquid spraying or flushing operations below the vapor level.

f. Turn off the degreaser if a strong Freon odor is evident.

g. Avoid ingestion or skin contact with the Freon liquid.

h. Do not permit Freon liquid to come in contact with any material whose temperature exceeds 150°C.

7.0 Emergency Action.

7.1 The following condensation of emergency action will be posted in the Calibration Facility:

See next page - - - -

CALIBRATION FACILITY

EMERGENCIES

FIRE:

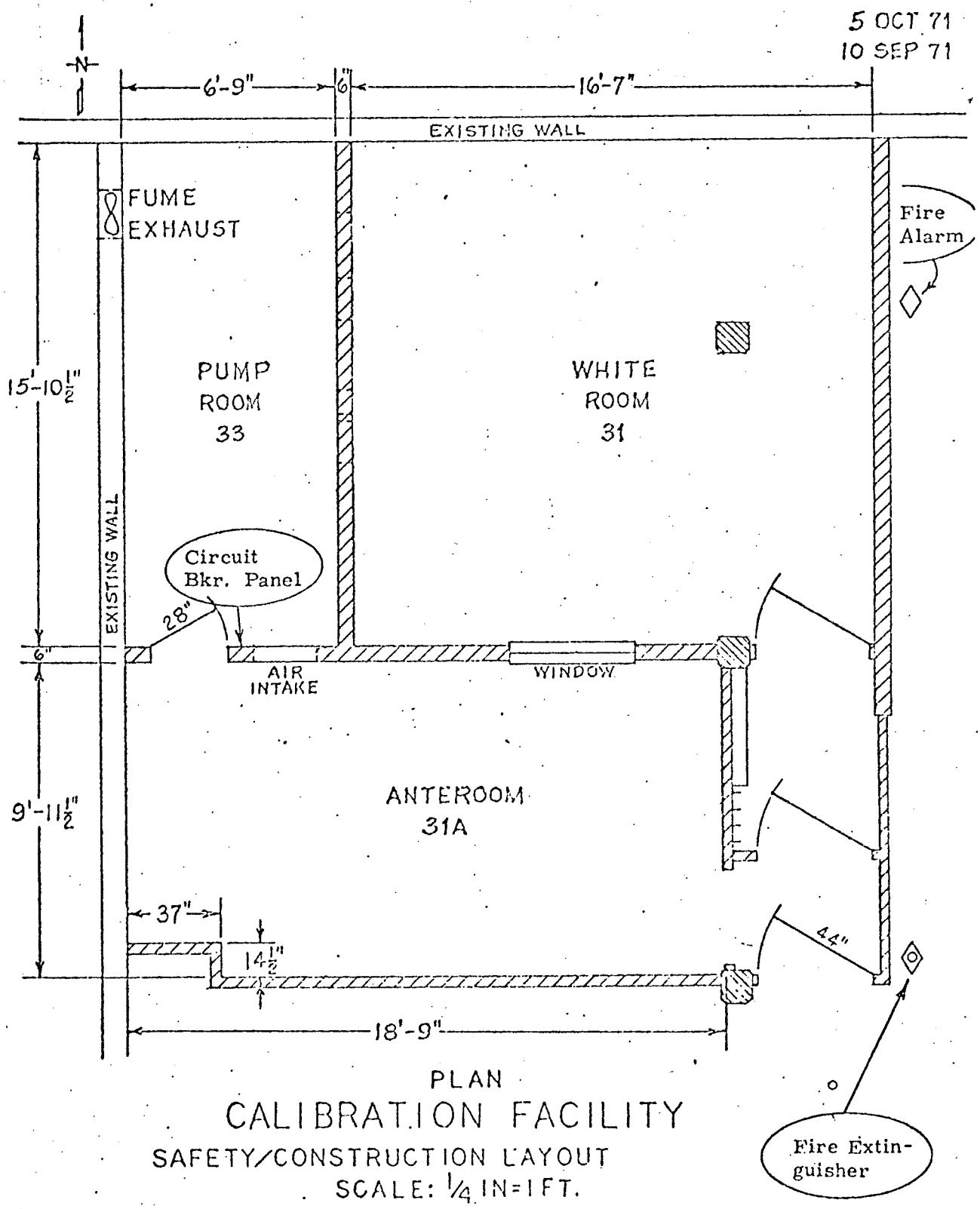
1. Shout "FIRE"
2. Evacuate personnel
3. Activate fire alarm (outside east wall of White Room)
4. Activate building ventilation alarm (outside east end of Rm. 30)
5. Telephone Ext. 471 or 9-366-3310
6. Attempt to put out fire

NOXIOUS VAPOR:

1. Evacuate personnel from hazard area.
2. Activate building ventilation alarm (outside east end of Rm. 30).
3. Telephone Ext. 361 (day) Ext. 471 (night)

SERIOUS INJURY:

1. Call City Ambulance 9-685-2440
2. Alert Campus Police (Ext. 471) to guide ambulance to Rowland Hall loading dock.



PLAN

CALIBRATION FACILITY

SAFETY/CONSTRUCTION LAYOUT

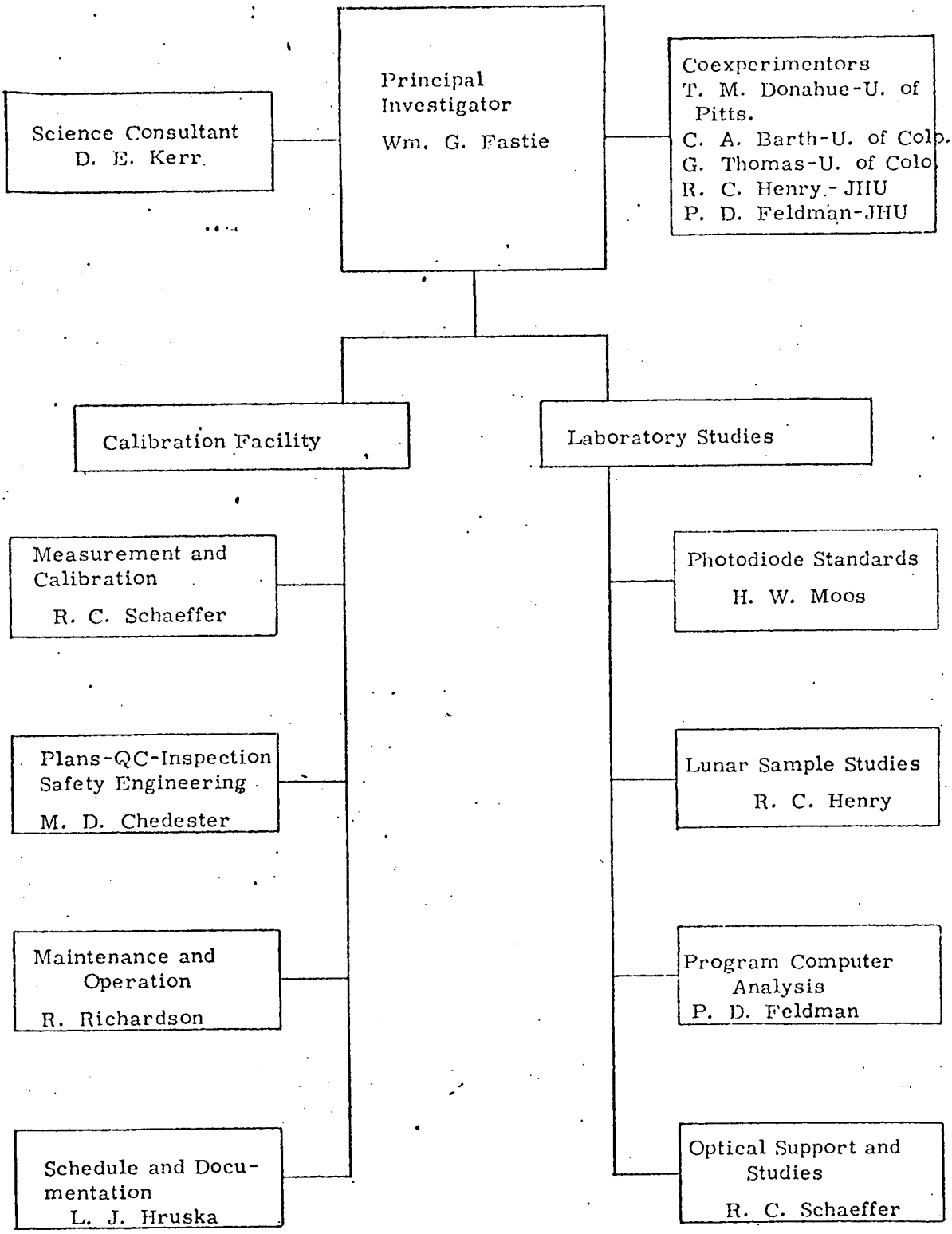
SCALE: ¼ IN = 1 FT.

FIG. 1

DWG. NO.

100,101

ORIG.



CALIBRATION FACILITY
ORGANIZATION CHART

FIG. 2